Title: Remodel, Reconfigure...Go Figure!

Brief Overview:

In this learning unit, third and fourth grade students will design the furniture and floor patterns for an ideal classroom. They will construct furniture shapes using pattern blocks and create patterns for floor tiles using flips, slides, and turns.

Links to NCTM 2000 Standards:

- **Standard 3: Geometry and Spatial Sense**
  Mathematics instructional programs should include attention to geometry and spatial sense so that all students analyze characteristics and properties of two-dimensional geometric objects; recognize the usefulness of transformations and symmetry in analyzing mathematical situations; and use visualization and spatial reasoning to solve problems both within and outside of mathematics.

- **Standard 6: Problem Solving**
  Mathematics instructional programs should focus on solving problems as part of understanding mathematics so that all students build new mathematical knowledge through their work with problems; apply a wide variety of strategies to solve problems and adapt the strategies to new situations; and monitor and reflect on their mathematical thinking in solving problems.

- **Standard 7: Reasoning and Proof**
  Mathematics instructional programs should focus on learning to reason and construct proofs as part of understanding mathematics so that all students recognize reasoning and proof as essential and powerful parts of mathematics; and make and investigate mathematical conjectures;

- **Standard 8: Communication**
  Mathematics instructional programs should use communication to foster an understanding of mathematics so that all students organize and consolidate their mathematical thinking to communicate with others; express mathematical ideas coherently and clearly to peers, teachers, and others; extend their mathematical knowledge by considering the thinking and strategies of others; and use the language of mathematics as a precise means of mathematical expression.

- **Standard 9: Connections**
  Mathematics instructional programs should emphasize connections to foster an understanding of mathematics so that all students recognize and use connections among different mathematical ideas; understand how mathematical ideas build on one another to produce a coherent whole; and recognize, use, and learn about mathematics in contexts outside of mathematics.

- **Standard 10: Representation**
  Mathematics instructional programs should emphasize mathematical representations to foster an understanding of mathematics so that all students create and use representations to organize, record, and communicate mathematical ideas; and use representations to model and interpret physical, social, and mathematical phenomena.

Grade/Level:

Grades 3-4

Duration/Length:

5 class periods

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Names and attributes of polygons
- Symmetry
- Creating patterns with blocks

Student Outcomes:

Task 1

Students will:
- explore and make shapes combining pattern blocks.
- work cooperatively with a partner.
- communicate an understanding of geometric shapes through written responses.

Task 2

Students will:
- show flips and slides with Linker Cubes.

Task 3

Students will:
- show turns using Linker Cubes.
- demonstrate an understanding of flips, slides, and turns by playing a game.

Task 4

Students will:

- write a letter using geometric vocabulary to describe and explain the results of combining shapes using models.
- uses models and drawings to demonstrate an understanding of combining geometric shapes.
- create a map key.

Task 5

Students will:.

- create and label a pattern using flips, slides, and turns.

Materials/Resources/Printed Materials:

Task 1

- The Greedy Triangle by Marilyn Burns
- Pattern blocks
- Response Journals
- Student Worksheet #1

Task 2

- Linker Cubes
- Overhead/chalkboard
- Student Worksheets #2A, 2B, 2C
- Response Journals

Task 3

- Linker Cubes
- Overhead/chalkboard
- Student Worksheet #3
- 1" Grid paper
- Game cards and instructions
- Response Journals

Task 4

- Pattern blocks: orange squares and green rectangles
- Overhead/chalkboard
- 1" Grid paper
- Pictures and architectural drawings of several room arrangements
- Student Worksheets #4A, 4B, 4C

Task 5

- Pattern blocks
- Overhead/chalkboard
- 8" x 8" plain paper
- Examples of real-world tiles with geometric designs.
- Student Worksheets #5A, 5B

Development/Procedures:

Task 1

- Read The Greedy Triangle by Marilyn Burns.
- Shape combinations: Students work with partners to make as many regular polygons as they can using green pattern block triangles. Guide students to create a trapezoid, parallelogram, hexagon, pentagon, and rhombus.
- Students record the shapes they constructed. (Student Worksheet #1)
- Have students make shapes with both green triangles and orange squares.
- Response Journals: Describe the shapes made and the number of triangles needed to make that shape. Use geometric vocabulary.
- Teacher-guided questions:
  - *Were there any shapes you couldn't make? Why?
  - *Which shape was the most challenging to create? Explain your answer.
  - *Which shapes were you able to make?
  - *What was the best part of this activity? Explain.
  - *Were there any polygons that you could make with only triangles? Which ones?
  - *Were there any polygons that could also be made by combining squares and triangles?

Task 2 - Slidin' and Flippin'

Sliding:

- Teacher demonstrates and students act out sliding. Teacher models sliding by physically demonstrating, i.e., standing and sliding. Students practice sliding.
- Teacher models on overhead or chalkboard by placing Linker Cubes on shapes and sliding them.
- Students practice slides. (Student Worksheet #2A)

Flipping:

- Teacher demonstrates a flip by helping a student do a hand-stand (not 360°).
- Teacher models on overhead/chalkboard: Arrange Linker Cube shapes along a vertical line of symmetry. Flip and trace each shape.
- Students practice flips along a vertical and a horizontal line of symmetry. (Student Worksheets #2B and 2C)
- Response Journals: Describe a "slide" and a "flip."

Task 3 - Turn, Turn, Turn

- Students act out varying degrees of rotations. Have 3 students stand shoulder to shoulder on a line on the floor. One student acts as a point and remains stationary as the line turns like a windmill, 90°, 180°, 270°. Repeat with the student at the opposite end remaining in place.
- Teacher models on overhead or chalkboard. Use 2 shapes from Task 2 activities. Trace 1 shape and mark 1 corner of that shape with a dot. Rotate the shape on that vertex 90°, 180°, 270° and trace each turn. Repeat with 1 other shape.
- Students practice turns. (Student Worksheet #3A)
- Play "Flip, Slide, and Turn" game. (Student Worksheet #3B)

Task 4 - Project

- Teacher presents the project situation on the overhead projector using Student Worksheet #4A.
- Teacher presents examples of various room arrangements in pictures and architectural drawings (bird's-eye view).
- Brainstorm possible furnishings for a classroom.
- Elicit names of polygons created in Task 1.
- Teacher models on overhead combining pattern blocks to create various shapes for furniture and placing furniture on grid paper.
- Students complete project on grid paper, according to the following directions:
  1. Use green triangular and orange square pattern blocks to create furniture in various shapes. Make at least 3 different polygons.
  2. Arrange models on grid paper. Position, trace, and color the shapes.
  3. Create a key. Label the shape name and the furniture it represents.
     Example: (Insert graphic)
- Students write a letter to the architect. (Student Worksheet #4B)
- Use assessment criteria. (Student Worksheet #4C)

Task 5 - Project

- Teacher displays a collection of real floor tiles with geometric designs.
- Teacher models flips, slides, and turns using pattern blocks to create a pattern.
- Students use pattern blocks to explore creating patterns.
- Project task: Choose at least one block to create a tile pattern that includes flips, slides, and turns. Trace, color, and label the kinds of moves. Teacher shows example on Student Worksheet #5A.
- Teacher gives students criteria/assessment, Student Worksheet #5B.

Extension/Follow Up:

- Make a three-dimensional model of the ideal classroom.
- Find the area of a designated part of the classroom.
- Using pattern blocks, create tessellations.

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Student Worksheet #1

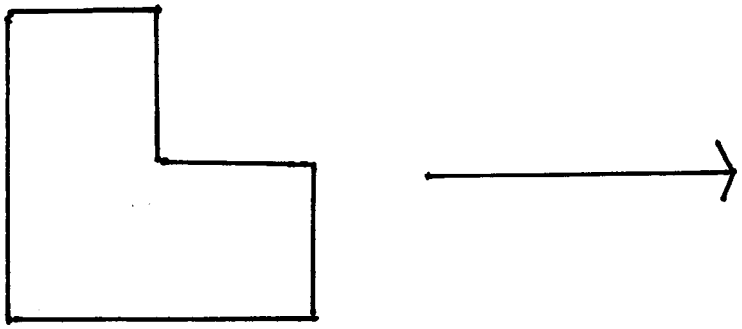
SHAPE COMBINATIONS!

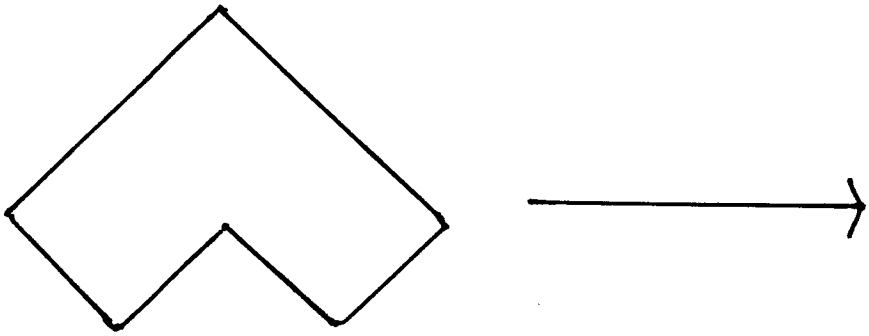
➵Use only green ▲ to make as many polygons as you can.
Trace each one.

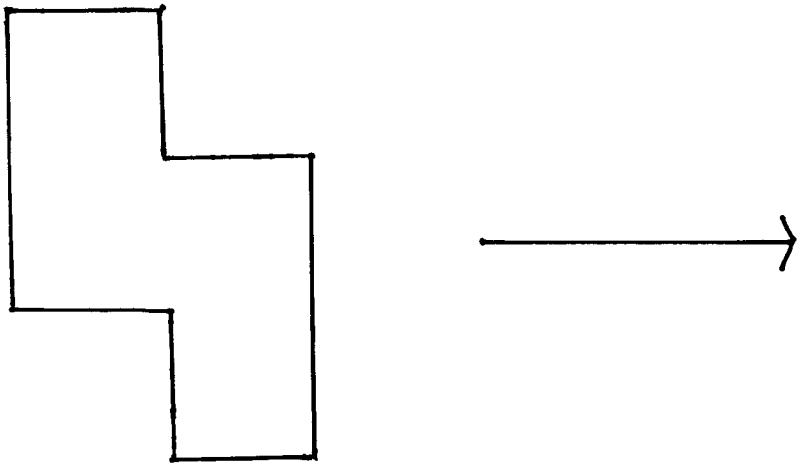
➵Use orange ■ and green ▲ to make additional shapes.
Trace each one.

SLIDIN'

➽Build each shape. Slide the shapes to the right and trace.

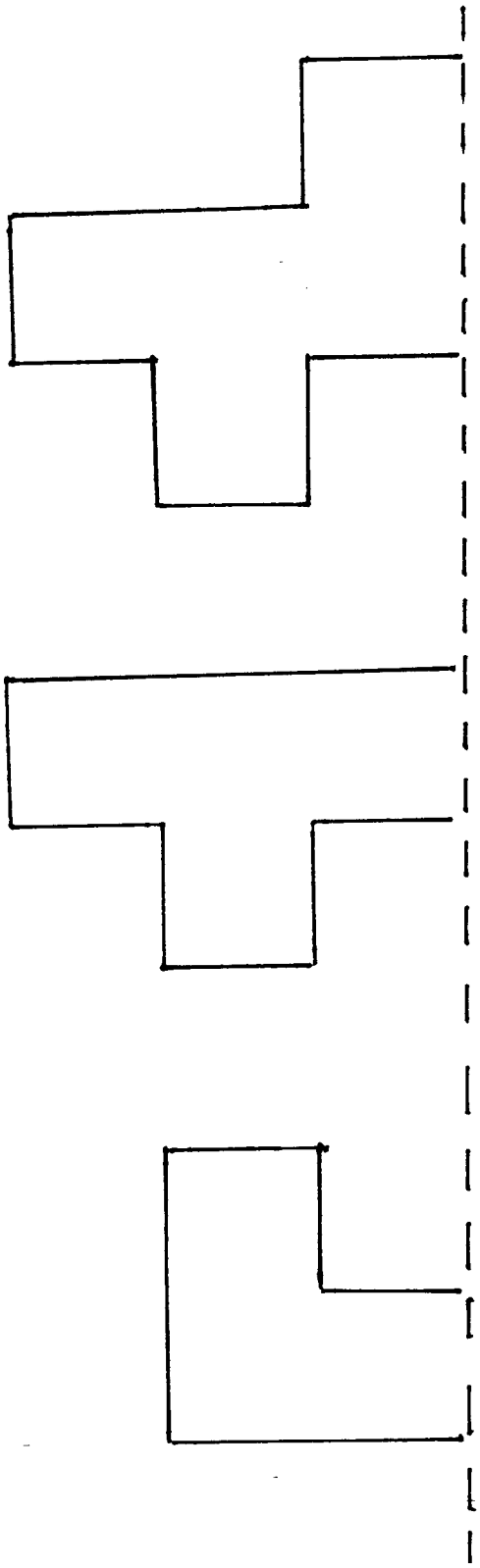






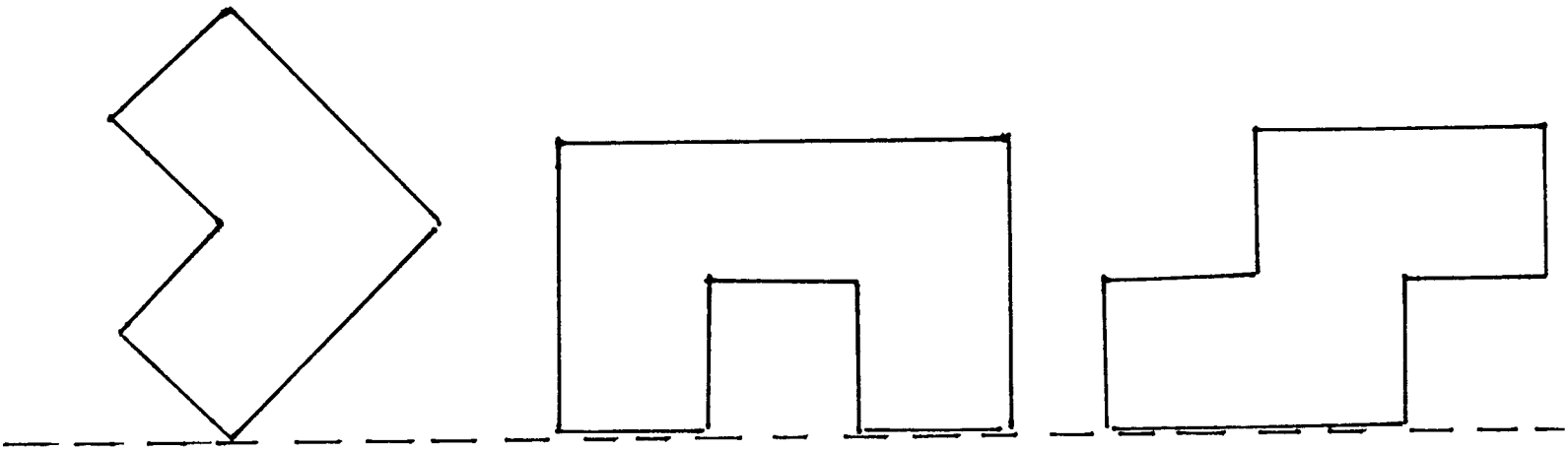
FLIPPIN'

Build each shape. Flip ↔ the shape over the <u>vertical</u> line of symmetry and trace.



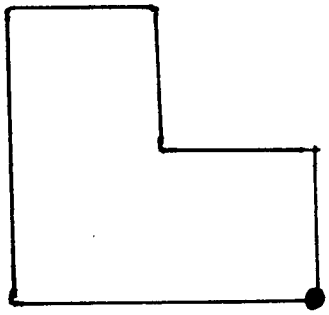
FLIPPIN'

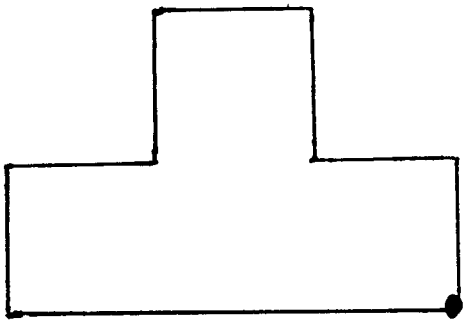
Build each shape. Flip ↕ the shape over the horizontal line of symmetry and trace.

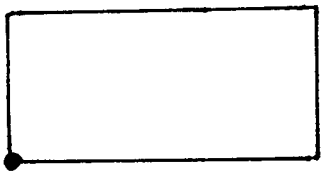


✡TURN, TURN, TURN

Build each shape. Turn the shape around the vertex (dot).







✽Flip, Slide, and Turn

Directions:

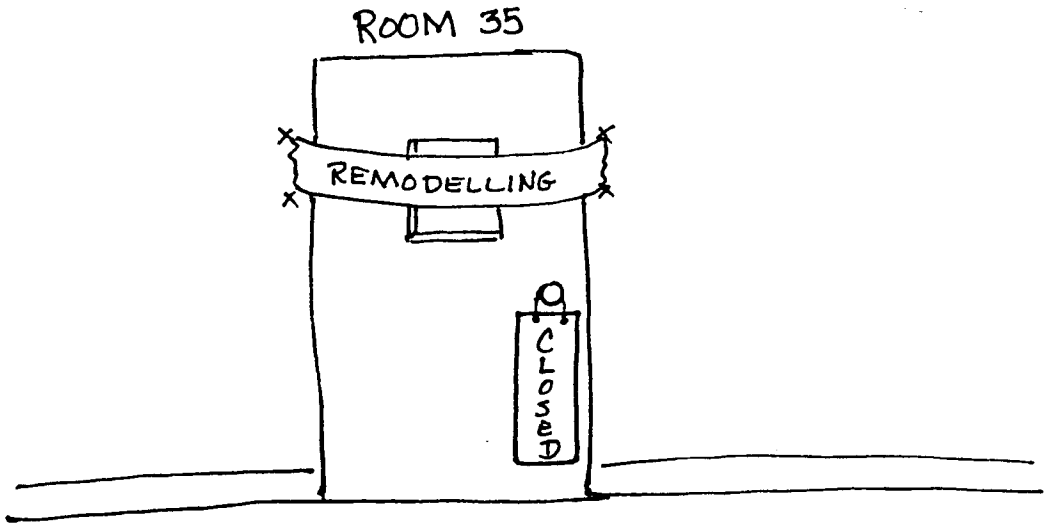
Partners decide on a shape made with 5 Linker Cubes to use as their game piece. Players take turns moving their shape from one end of the grid paper to the other. The winner is the person who reaches the other side of the grid paper first.

1. Each player has his own grid paper and a LinKer Cube shape.
2. Make game cards.
   Cards: 4 slide cards
   4 turn cards
   4 flip cards
3. Cut the slide, flip, turn game cards apart, mix them up, and place them face down in a pile.
4. Players take turns taking a card and moving accordingly.
   *A slide can only be one length of the shape.
5. Players trace and color each move.
6. A person wins by reaching the other side first.

REMODEL, RECONFIGURE~ GO FIGURE!

- What would your ideal classroom look like? This school will be renovated next year and the architect would like to have students' ideas. Your class has the opportunity to submit plans that could be selected as the model for all classrooms.

- You will design furniture. Then write a letter to the architect. Let's get started!



Student Worksheet #4B

Writing prompt ✍

✎Write a letter to the architect. Name and describe your furniture pieces. Explain how each one was constructed.

_____

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STUDENT WORKSHEET 4C

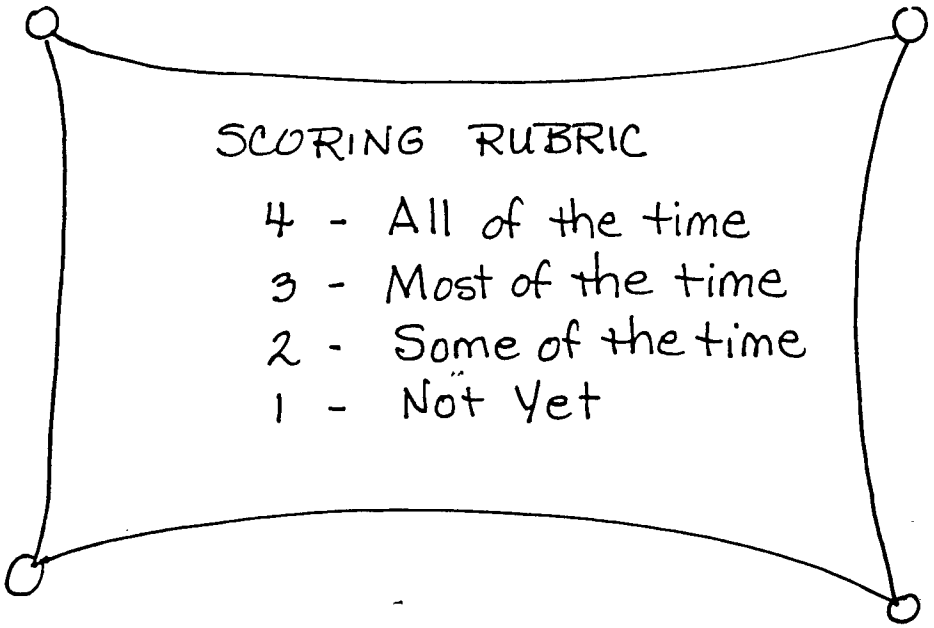
PROJECT CRITERIA

My Design...

- ☐ has 3 different polygons as furniture.
- ☐ shows combinations of shapes.
- ☐ includes a key with correctly labelled polygons.

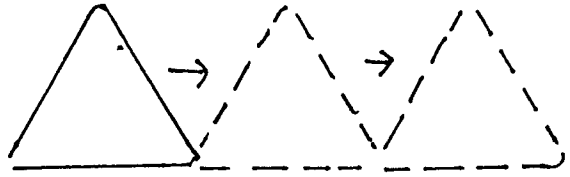
My Letter...

- ☐ contains accurate geometric vocabulary.
- ☐ explains how each shape was created.

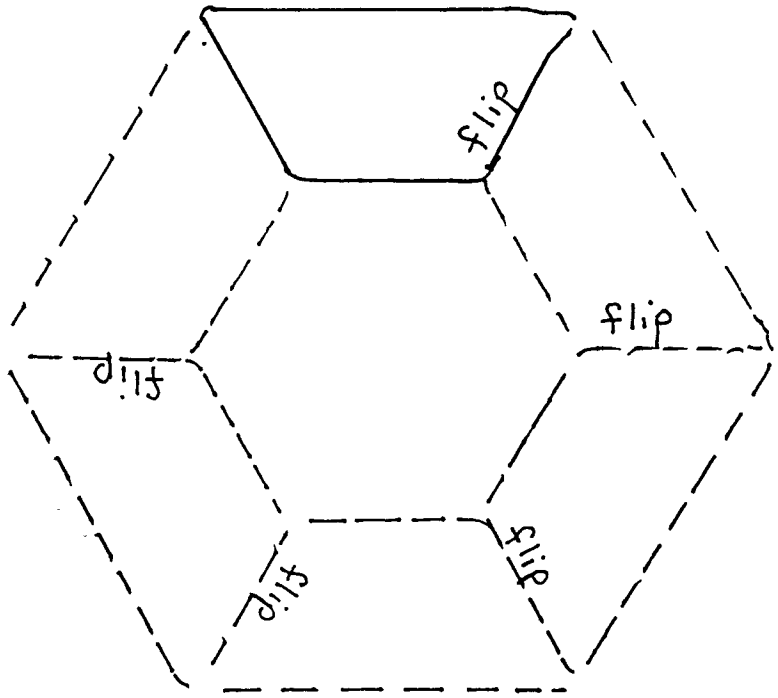


Examples of Patterns Student Worksheet 5 A

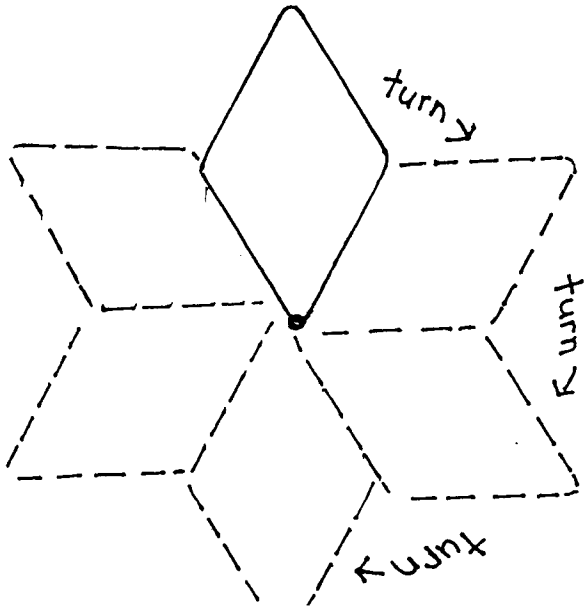
Slides



Flips



Turns



Student

Worksheet 5B

FLOOR TILE PROJECT CHECKLIST

- ☐ Labelled slide correctly
- ☐ Labelled flip correctly
- ☐ Labelled turn correctly
- ☐ no gaps
- ☐ Clear and complete pattern

Scoring Rubric

4 - All of the time
3 - Most of the time
2 - Some of the time
1 - Not Yet